The Cryosphere Discussions

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Comment on tc-2022-155

Anonymous Referee #1

Referee comment on "The temperature-dependent shear strength of ice-filled joints in rock mass considering the effect of joint roughness, opening and shear rates" by Shibing Huang et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-155-RC1, 2022

The variation of shear strengths of ice-filled joints is one of the important factors causing rockfall activities. The authors systematically investigated the influence of joint roughness, temperature, shear rates, joint openings and normal stress on ice-filled joint masses shear strength. I find this paper is novel and interesting. Therefore, I think it could publish on The Cryosphere after a revision. The following comment may help the authors to improve this manuscript.

Abstract part should be compressed and polished. Line 24~25 should be deleted, because it is not the main conclusion of this study.

Red sandstone blocks with dimensions of 100×100×50 mm^3 were used to engrave roughness curve. However, a certain amount of specimen thickness is consumed during engraving. The ice-filled joint masses may not be a standard 100×100×100 mm cube. This point should be claimed and whether the height of ice-filling samples has any effect on the shear strength should be explained.

Line 69. “normal stress” should be deleted, because the previous literature has considered the effect of normal stress.

In Fig. 2, it can be seen that when studying the influence of different shear rates and joint openings on the shear strength of ice-filled joint, the experimental temperature is -5 â□□. Why -15 â□□ is used as the experimental temperature under different normal stress. This may be not conducive for comparison. Can you explain it?

In Fig. 7, why the error bars are not added, because three parallel experiments were

conducted?

Line 193~195. The turning point of brittle and ductile failure of pure ice at different temperatures is not clear. It is suggested to compare the present results with other studies and describe the macroscopic or microscopic failure phenomena more clearly.

Figure 16 - This figure show the effect of normal stress on the peak shear strength of ice-filled joints, the experimental condition should be corrected as T = -15 â□□, v = 0.2 mm/min and d = 2 mm.

It is interesting to propose the noticeable bulges to explain the change of shear strength of ice-filling joints against the joint roughness. However, how to determine the noticeable bulges and what is the characteristic of these noticeable bulges need more evidences.

The conclusions should be compressed and improved, for example the sentence “Above all, this study … normal stress” may be shorten or deleted.

Line 329 to 333 – Where should be replaced by “where”.

Line 12. “was”should be replaced by “were”. It is suggested to polish the English carefully.

It is suggested that the authors search for the literature related to "ice-filled rock joints " or "ice-filled rock flaw" and cite it appropriately in the introduction.